

CGSR WORKSHOPS, 2003.
President Eisenhower's "Atoms for Peace" After 50 Years
Comments by Dr. G. C. Lowenthal in Response to his Invitation

Regrettably, I could not accept your invitation, but you may permit me to submit this Note to stimulate discussions on two questions (as you call them) which I consider of the utmost importance for these workshops: How can the wide-spread ignorance among the public at large about radioactivity and ionising radiations be more effectively remedied than so far? Also, how could the public be made to gain more realistic ideas about risks to health caused by these radiations when absorbed at intensities of the order of the average natural background radiations.

In your Program the items "Education and Public Confidence" feature with several others among the introductory comments to Workshop 3. In my view they should have been mayor items in their own right among the questions of workshops 2 and 3. In what follows I can only offer a few comments on these problems. Members of your workshops will deal with them as they deserve.

President Eisenhower, in his "Atoms For Peace" address commented on the need to educate the public (in 1953 the principal risks which had to be known about realistically were risks due to nuclear bombs). He stated "*if the peoples of the world are to conduct an intelligent search for peace, they must be armed with the significant facts of today's existence*". For President Eisenhower – and no doubt, everyone else at the time – the horrors of nuclear power were, principally, the horrors caused by nuclear bombs.

Nuclear bombs remain rightly feared beyond everything else. However, there is an added risk following exposures to ionising radiation. It is the risk from cancers. The connections between nuclear explosions and cancer are part of the significant facts of today's existence. Radiation Protection Authorities have been assuming since the mid1960s that absorbed ionising radiations even of the lowest intensity could cause risks from cancers with non-negligible probabilities.

There is well known evidence that absorbed dose rates of ionising radiations exceeding about 500 mSv per year could be followed by cancer, though the delay would be at least a few years. However, it has not been possible so far to obtain evidence of cancers following absorbed dose rates below about 200 mSv per year notwithstanding numerous investigations over several decades (see e.g. OECD Report 1998, Sections 2 and 3. Nuclear Energy Agency, Paris, France).

The International Commission on Radiological Protection (ICRP) recognises that there is no verifiable evidence for cancers due to low intensity radiation as just noted. However, bearing in mind public fears of carcinogenic effects, the ICRP felt that it had to adopt policies leading to conditions which would be recognised by the public to be as risk free as possible.

An almost hysterical display of public fear of ionising radiation occurred following the April 1986 explosion in a Soviet built nuclear power reactor at Chernobyl, Ukraine. Radioactive dust (at low concentrations as shown later, see below) was indeed blown across many parts of Europe reaching even the USA. That many European governments, in answer to popular agitation, confiscated entire crops of “contaminated” agricultural products, mainly vegetables, to protect their population from cancer was a gross over-reaction to irresponsibly sensational news media reports.

Many specialists in the nuclear sciences and others with sound knowledge of likely consequences of nuclear power reactor accidents urged a common sense approach at the time but in vain. Fear of cancers caused by ionising radiation remained as strong as ever. The cautioning comments of a few specialists were justified when a United Nations press release of June 2000 quoted estimates of risks of cancers caused by fall-out from *all* past reactor accidents as less than 0.5 percent of risks due to the average background radiation unavoidably absorbed by everyone.

The Chernobyl explosion furnished a strong proof of the widespread public ignorance about the sciences of radioactivity and ionising radiations. Even so, a large fraction of the public continues to ignore the advice of thoughtful fellow citizens but accepts as truth the rumours spread by journalists well known for their love of exaggerations and the abuse of anti-nuclear activists making the most of every opportunity to stimulate fear of ionising radiations..

What is also ignored by nearly everyone is evidence for bio-positive effects of low intensity ionising radiation as well as hormesis. There are several regions, e. g. the Rocky Mountain states of the U.S.A. where higher than average background radiation appear to cause significant benefits to the health of the population. The benefits include longer life expectancy, higher fertility and lower cancer rates than observed on average for populations in regions with lower background radiations.

Evidence of bio-positive effects of absorbed low intensity ionising radiation was published in numerous scientific journals over the past 10 years and longer. But the news media ignored it and the ICRP refuses to credit reports of bio-positive results as too uncertain to be accepted for radiation protection. According to the ICRP, backed by a large part of the public, to tolerate ionising radiation exposures even of the lowest intensity simply on claims of reported bio-positive effects is likely to increase risks of cancer.

The number of publications reporting bio-positive and hormetic effects has been increasing every year (see e.g. M. Myslobodsky, “The Origin of Radiophobia”, *Perspectives in Biology and Medicine*, 44/4, 2001,:543-55). At the same time demands for more rational policies on risks from low intensity ionising radiations have become more frequent. These demands are now being noted by Radiation Protection Authorities. However, these Authorities could hardly be expected to accept such far-reaching changes in their policies “over night”. It will need constant pressure on Radiation Protection Authorities probably over many years to ensure that there will be progress in the right

direction. The CGSR Workshops would be an excellent occasion to exercise pressure.

Meanwhile, radiation protection authorities continue to search for evidence of cancers and related diseases caused by low doses of ionising radiation to justify the high costs in money and manpower of their regulatory efforts. Regrettably, very much less is done to educate the general public (as distinct from school children and university students) about radioactivity and the emitted radiations to provide the public with at least a modicum of knowledge which could permit more realistic opinions about risks from ionising radiation than at present. Many of them had learned about the nuclear sciences in their younger days, but what they had learned was evidently forgotten.

Changing risks which had been dominant for over 30 years is far from easy even in less critical situations. It is especially difficult in the present case when, for all these years, regulatory and public health authorities in many if not most countries have educated and thereby frightened the public to expect that there is no safe absorbed dose of ionising radiation, no matter how small and that hormetic responses to ionising radiation are wishful thinking..

In fact, careful toxicological studies made by numerous biologists have shown that the dose-response effects for strong poisons is nearly always hormetic. High doses of a poison are highly toxic but sufficiently low (hormetic) doses (of sub-microgram per kilogram levels for normally strong poisons such as cadmium and lead), become bio-positive. Doses which are *lower* than the hormetic level could be shown to be more harmful than hormetic doses. That ionising radiations appear to act hormetically (similar to cadmium and lead) has been demonstrated many years ago (see e.g. P.A.Parsons, 2000, "Hormesis, an adaptive Expectation with Emphasis on Ionising Radiation", J.Appl.Toxicology, 20:103/112).

To introduce more detail about our subject is not practical without making this Note unduly long. No-one at the CGSR Workshops will doubt that it is essential to lessen the deplorable ignorance about a topic of high and yet still growing importance for economic as well as engineering reasons, not to mention overall security and good sense. I am confident that members of the Workshops will be able to develop methods to finally replace ignorance if not by knowledge than at least by willingness to listen to thoughtful and responsible guides instead of guides who are sensation hungry and nothing else.